A Project Report on

Single Compact Device to Assist People with Vocal,Visual and Hearing Impairment using Raspberry Pi

Submitted in partial fulfillment of the requirements for the degree of

BACHELOR OF TECHNOLOGY

in

Computer Science and Engineering

by

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Under the Guidance of

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Computer Science and Engineering

CERTIFICATE

This is to certify that **Jeffaniel Aashish and Aparna Prakash** has successfully completed the project work entitled "**Single Compact Device to Assist People with Vocal,Visual and Hearing Impairment using Raspberry Pi**" in partial fulfillment for the award of **Bachelor of Technology** in **Computer Science and Engineering** during the year **2020-2021**.

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BONAFIDE CERTIFICATE

It is to certify that this project titled ”Single Compact Device to Assist People with Vocal,Visual and Hearing Impairment using Raspberry Pi” is the bonafide work of

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Examiners [Name and Signature]

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Date of Examination :

Acknowledgement

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Declaration

We, hereby declare that the project titled "**Single Compact Device to Assist People with Vocal,Visual and Hearing Impairment using Raspberry Pi**" is a record of original project work undertaken for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering**. Wehave completed this study under the supervision of **Praveen Naik**, Department of Computer Science and Engineering, .

We also declare that this project report has not been submitted for the award of any degree, diploma, associate ship, fellowship or other title anywhere else. It has not been sent for any publication or presentation purpose.

Place: School of Engineering and Technology, CHRIST (Deemed to be University), Bengaluru
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Abstract

Addressing individuals with vision, hearing and vocal disability problems through a common support system is a tough task. Many modern day researches concentrate on solving one of the above-mentioned problems but not all. This work is performed specifically to discover the unique solution or technique to assist people with vision, auditory, vocal disability of conversation. This system helps those with impairments to interact with each other, and also with the normal person. All three of these solutions have been modulated to be in one unique system which is synchronized with Raspberry Pi's use. The work focuses on discovering a new methodology that supports visually impaired people by helping them to understand what is interpreted as text, and the technique used is Tesseract OCR (online character recognition) that takes the vision through a camera and transforms the available text as speech signals. The project provides a way for people with hearing impairment through a software process that helps them interpret what the other person is saying as the speech is converted to text and the project also provides a way for people with voice disability to represent their voice through the use of text-to-voice conversion technique by typing down a text which is converted to a voice message so that the other participants can hear the message through a speaker. Additionally, The project supports communication between people with hearing and vocal impairment and the normal masses by converting their hand gestures to text.

***Keywords*:** Raspberry-pi, Assistive device, Tesseract Optical Character Recognition OCR, espeak, OpenCV, Pyttsx3.

Contents

LIST OF FIGURES

LIST OF TABLES

GLOSSARY

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Item	Description
Raspberry Pi	A small computer that plugs into a monitor and uses a standard keyboard and mouse. It is capable of doing everything a computer can.
Assistive device	Device that helps someone do something that they might not otherwise be able to do well or at all.
Data Analysis	Process of inspecting, cleansing, transforming and modelling data to get useful output.
Optical Character Recognition	Conversion of images of typed, handwritten or printed text into machine-encoded text.
Speech synthesis	The artificial production of human speech using systems like text to speech
OpenCV	A library of programming functions mainly aimed at real-time computer vision.
Visually impaired	A decreased ability to see to a degree that causes problems not fixable by usual means.
Disabilities	A physical or mental condition that limits a person's movements, senses, or activities.
YOLO Algorithm	A clever convolutional neural network (CNN) for doing object detection in real-time.
Vocally impaired	Condition in which the ability to produce speech sounds that are necessary to communicate with others is impaired.
Hearing Impairment	Also known as hearing loss, it is a partial or total inability to hear.

Chapter 1

INTRODUCTION

According to World Health Organization, About 285 million people worldwide are considered to have visual impairment in which 39 million are blind and 246 are said to have low vision. Approximately 90 percent of the visually impaired people in this world are from the dispirited people with poverty and 82 percent of those living with blindness aged and above. According to global projected research, the number of people visually impaired by eye-related diseases has been raising in the last 20 years. In which it is possible to prevent or heal 80 per cent of all visual restitution. India is known as the venue for the world's largest blind event. About 37 million in this country are blind, 15 million of which are from India. There are so many people in this field that were getting by, but the vision deficiency could not be overcome for good. In the lodge to encourage these people, we have created the assistive system for blind people who do not want other neighbours' assistance. This project creation allows the plurality to feel themselves free and go independently.

Around 9.1 billion people are deaf and mute throughout the world. They face a lot of problems in their daily life on their communication. Sign language is a tactile mechanism used by average people and people with disabilities to communicate. Sign language is based on sign gestures such as the person's body posture and arm movements to encourage the discernment between the unwashed wonderful. The deaf and vocally impaired people don't just need to learn the custom sign language, but the core issue is that they can communicate with the society's usual kind of multitude. Likewise, it is not possible for all the people to know the sign language through signs and comprehend what is said.

Therefore there are always contact differences between the deaf and the dumb. Obviously, dumb people will tilt the message by sign language which other people could not understand. This project uses a tiny sized device called raspberry pi to overcome these problems for visually and vocally impaired people. It provides the remedy through this tool for the blind, deaf and dumb. The picture is translated to speech by using Tesseract software for blind people, the deaf people got their information by video as soon as it was presented as a message by the opposite user. Instead of sign language transmitted through e-speak, the stupid people communicated their message by email. The project also provided the necessary steps to address certain masses ' problems. Besides this, the project has introduced another program to translate hand gestures to text, so that people with auditory and vocal difficulties who learn sign languages can interact quickly with people without disabilities.

1.1 Problem Formulation

In the application, the problems are that the network should be there to communicate, The people should know to run the application, Proper English should be spoken to the Speech to Text module ,Proper English should be written to the Text to Speech Module and for the hand gestures the communicator should show the proper sign in the application.

1.2 Problem Identification

In today's world , people with vision, hearing and vocal impairments face plenty of problems on their communication.For the blind there are various systems that assist in communication like the braille system , Screen reader, finger reader and bar code reader but these systems have many drawbacks because Visually disabled people in Screen reader only take note of the text shown on the cover, and do not have the ability to understand the proper spelling of other words such as medical terminology and other scientific terminology. The chief weakness in Finger reader is that it can only handle English languages and could not make out. And the key causal agents in the bar code reader are that they may be easily broken, if so empty, and the scanner often finds it difficult to recognize the words. For the people with hearing and vocal disabilities the sign languages are the most commonly used and so it may not be readily understood

by average people. It isn't appropriate for all people use sign language to communicate with the voices and deaf people. Usage of sign languages is the hardest job for all contact in real time. The proposed system aims to help the visually impaired people to understand the words easily by Tesseract software. The vocally impaired people can communicate their message through text which can be read out by e-speak. The deaf people can be able to hear others speech from text. Hand Gestures is for Dumb and Deaf people which will helps them to communicate easily by just showing sign language.

1.3 Problem Statement & Objectives

The project is intended to help people with disabilities such as the dumb, deaf and mute to communicate with each other and to people with no disabilities without requiring the need for a human assistance through a single compact device that serves them all.

1.4 Limitations

The project involves the use of many input devices such as a camera , microphone and a keyboard and output devices such as the speaker and LCD Display hence making it a less likely portable device and less compact . The datasets involved in the project are limited in number due to time constraints. The processing time is quite slow for some of the components of this device . And the language is limited to only English.

Chapter 2

LITERATURE SURVEY AND REVIEW

In order to understand the problems of the existing system as well as to propose a system to overcome their drawbacks we refered the below mentioned list of papers. These papers provided an overview of the existing system and their future scope.

2.1 Literature Collection & Segregation

[1] Chucai Yi, Student Member, IEEE, Yingli Tian, Senior Member, IEEE, and Aries Arditi "Portable Camera-Based Assistive Text and Product Label Reading From Hand-Held Objects for Blind Persons" 2013 IEEE.

To help blind people read text labeling and product packaging from hand-held items in their daily lives, we suggest a camera-based assistive text reading system. To detach the target from the camera view from cluttered surroundings or other nearby objects, we first suggest an efficient and effective motion-based approach for identifying a region of interest (ROI) in the video by asking the viewer to shake the object. This approach removes moving target area using a context subtraction process based on a mixture-of-Gaussians. For the acquisition of text content, text localization and recognition are performed in the extracted ROI. To automatically identify the text regions from the ROI set, we propose a new text localization algorithm by studying gradient characteristics of stroke orientations and edge pixel distributions in an Adaboost model. Off - the-shelf optical character recognition (OCR) program then binarizes and recognizes text

characters in the regional language areas. The understood text codes are generated in speech for blind people. On ICDAR-2003 and ICDAR-2011 Robust Reading Datasets, efficiency of the proposed text localization algorithm is evaluated quantitatively. Experimental results demonstrate that our algorithm is attaining state of the art. The proof-of-concept test is also tested to determine the efficacy of the system's equipment on a data set obtained using 10 blind people. We discuss user interface problems, and evaluate the algorithm's robustness in extracting and reading text from various objects with complex histories.

[2] Vasanthi.G and Ramesh Babu.Y Department of ECE, DMI College of Engineering, Chennai, India. "Vision Based Assistive System for Label Detection with Voice Output"Jan-2014.

A camera-based assistive text interpretation system is introduced to help blind people read text labels and package the product from portable items in their everyday residences. To separate the object from cluttered surroundings or other nearby objects in camera view, by asking the user to shake the object, we suggest an efficient and effective motion dependent approach to identify a region of interest (ROI) in the frame. For the acquisition of text content, text localization and recognition are performed in the extracted ROI. We propose a novel text localization algorithm to automatically identify text regions from the ROI object by studying gradient features of stroke orientations and edge pixel distributions in an Adaboost model. Off - the-shelf optical character recognition program then binarizes and identifies text characters in the regional text areas. The recognized text codes are output in speech for blind users.

[3]Dharanikumar Chowdary. M, M. Narasimhulu, G. Subrahmanya Sharma, "Advanced Embedded Chatter Box For Physically Challenging Persons" in Jan 2012.

This paper discusses the introduction of a communication system for physically challenging people. This tool will be a solution for people with speech and/or hearing difficulties. The aim is to help the physically disabled in communication. The Consumer Edition will be 6.7"x 5.6x 1.25" lightweight. This will include 16x 2 standard LCD characters-black on 3.3V white. Non-speaking Individuals with problems with their fine motor skills may also use text-to-speech to assist their abilities, including those suffering from:. ALS (Lou Gehrig's syndrome· Traumatic brain injury· Laryngectomy· patients recovering from first stroke.

[4] Bhavina Patel,Vandana Shah, Ravindra k Shirsagar, "Microcontroller Based gesture Recoginition Syatem For the Handicap People"in Dec-2011.

"Speech" and "gestures" are the expressions mostly used in human communication. A like using-learning starts with the first years of life. The use of voice and gestures in human communication is completely co-ordinated. Arm movement and understanding in sign language is about recognizing movements and sign language using gloves. A variety of hardware techniques are used to collect body positioning information; usually either image-based (using cameras, rotating lights, etc.) or device-based (using instrumented gloves, location trackers, etc.) although alternatives are beginning to develop. But it is only the first step to get the data. The second step is much more challenging, especially in a continuous stream, to recognize the sign or gesture once it has been captured. In fact this is the research's focus at the moment.

[5]. Suvarna Nandyal, Shireen Kausar, " Raspberrypi Based Assistive Communication System for Deaf, Dumb and Blind Person" in August 2019

It is a challenging job to assist people with vision, auditory, vocal disability through the modern system. Scientists today concentrate on addressing the problems of one of the disability, but not all at once. This work is performed specifically to discover the unique solution / technique to assist people with vision, auditory, vocal disability of conversation. This system helps those with impairments to interact with each other, and also with the normal person. The central part of the work on which all the operations are carried out is Raspberrypi. The research helps visually impaired people by helping them know what's happening in the text format. The spokesman points out the recorded text style. The audio signals are transformed to text format by using speech to text translation technique for the people with hearing impairment. This is done using the AMR speech app to help us hear what the person says can be shown as a text message. And for those with speech disorder, they express their words with the aid of speakers.

[6]. Srilakshmi S, Dr. Shabana Sultana ," Interactive Gesture Based System with Email Access and Voice Command for the People with Visual, Hearing and Speech Impairment Using IoT" in May 2018

The development of communication technology in combination with IoT facilitated communication. Such emerging technologies have benefited the human race with a wide variety of applications. However it is difficult for the visually impaired (blind) to access these technologies because they require visual sensitivity. According to the study, 2.78 percentage of people in our country have hearing and speech disability (dumb).In order

to communicate with others, individuals with visual, hearing and speech impairment use the movement of their hands and movements (gestures) as this method of communication involves a lot of ambiguities. There is also a need for a network to create contact with the population between the affected sight, hearing and voice. A large-scale microcontroller system and an accelerometer-equipped data glove are proposed to facilitate communication between the stupid, deaf and visually impaired and communicate with the common people. This system can be dynamically reconfigured to work as a ”smart device.” Using a data glove equipped with an accelerometer sensor, gestures are made in this system. And the microcontroller-based system transforms listed gestures into identifiable human voice and produces an email with predefined images and subject matter.

Chapter 3

ACTUAL WORK

In the proposed system , we aim to help The visually impaired people to understand the words easily by Tesseract software. The vocally impaired people can communicate their message through text which can be read out by e-speak. The deaf people can be able to hear others speech from text. Hand Gestures is for Dumb and Deaf people which will helps them to communicate easily by just showing sign language.

3.1 Hardware and software Requirements

3.1.1 Hardware Requirements

Raspberry pi

Raspberry Pi is a low-cost, credit card-sized processor that can perform any function we demand from a desktop with ease. Raspberry pi is very easy to connect to computers and televisions. It also provides the connection of GPIO (General Purpose Input Output) pins to other components. Despite of this versatility it has been used in a number of projects to intercommunicate with the cross-disciplinary domain. Raspberry pi runs in an open source environment like Raspbian (Operating System based on Linux).

Camera Module

The camera used for the project is a webcam iball. The video taken is smooth and contrasted. This camera blends well into the project as it transitions for lighter contrast images to the lighting conditions. Uses a universal clip to securely connect to the mount. It is lightweight, flexible and agile, so it's handy in the project.

SVGA Monitor

A Super Video Graphics Array Display (SVGA) is an output system that uses the SVGA format. SVGA is a standard video display type developed by the Video Electronics Standards Association (VESA) for personal computers (PCs) compatible to IBM PCs. SVGA provides a number of computer display standards used in computer monitor and screen manufacturing. It has a resolution of 800x600 pixels on the screen.

Keyboard and Mouse

One of the main instruments for the input is a computer keyboard. In this 5-inch display, a keyboard was hardwired according to the project specifications for the vocally impaired person to type their text into the computer. A computer mouse is an input tool used on a computer. Moving a mouse over a flat surface will shift the cursor to various on-screen objects. You can push or select objects by clicking on the mouse buttons

LCD Display

A liquid crystal display (LCD) is a flat panel display or other electronically modulated optical device using liquid crystal light-modulating properties combined with polarizers. This project includes a 16x2 LCD screen to display the text output for the deaf masses

Microphone

A high quality mini portable USB microphone is used in the project. It's a microphone cancelling noise that blocks out un-wanted background noise. For the project, it comes as a brownie point, as it is lightweight, compact and simple to use. It can be made more effective by increasing the gain control or capture for better accuracy, depending on the user or context.

Speaker/Headphones

In this project a speaker or a headphone is used. The function of the speakers and headphones are to produce audio output which the listener can hear. Speakers and headphones are transducers which convert electromagnetic waves into waves of sound. Audio input from a system such as a computer or audio receiver is provided by speakers and headphones.

3.1.2 Software Requirements

Operating System - Windows xp,7,8,10

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a program that performs all critical tasks such as file management, memory management, process management, input and output handling, and controlling peripheral devices such as disk drives and printers.

Python 3.7

Python is an interpreted, high-level, general-purpose programming language.Python can be easily learned, and used. It is programming language which is developer-friendly and of high level. It is more descriptive, meaning it is more comprehensible and readable. It is an interpreted language, i.e. interpreter executes the line of code at a time by line. This makes debugging easy for beginners, and therefore suitable. It can also run on various platforms such as Windows, Linux, Unix, and Macintosh etc. So, we might say Python is a portable language. On the official web page, Python language is freely accessible. The source code is also accessible. It is therefore open source. Supports object-oriented language, and come into being definitions of classes and artifacts. It means that other languages such as C / C++ can be used to compile the code, and can therefore be included in our python code further.Can be used to create graphical user interfaces. It has a large and wide library, and provides a rich collection of modules and functions for rapid creation of application. some of the the libraries used in this project are pytesseract , pyttsx3 , speech_recognition and numpy(opencv library).

Tkinter

Tkinter is a Python toolkit which binds to the Tk GUI. It is the basic Python interface for the Tk GUI toolkit, which is the de facto reference GUI for Python. Tkinter comes with standard Python installations for Linux, Microsoft Windows, and Mac OS X. The Tkinter name originates from the Tk interface.

VNC Viewer

Virtual Network Computing (VNC) is a graphical1desktop networking device used to remotely manage the RFB(Remote Frame Buffer) protocol to another machine. It connects keyboard and mouse events over a network to another device. VNC is an autonomous, commercial and personal-use remote access software platform. Using a VNC server program it uses VNC technology to connect to a remote device. To achieve remote control VNC Viewer gathers data and sends it to VNC Server. In our project, we use a VNC viewer program for remote logging to Raspberry Pi.

3.2 Methodology for the Study

For blind people the image is converted to voice by using Tesseract software, the deaf people receive their content by message as soon as the opposite person speaks out it displayed as a message. The dumb people convey their message through text instead of sign language which is delivered via e-speak. We have provided necessary steps to resolve the problems of those masses. Also, people with hearing and vocal disabilities who know sign languages can easily communicate with people with no disabilities via hand gestures which gets converted to text.

3.3 Experimental and or Analytical Work Completed in the Project

TTS Algorithm

Text-to-speech (TTS) is a type of speech synthesis program that is used in a computer document to produce a spoken sound version of the text, such as a support file or a web page. TTS may require the visually challenged person to read the computer display content, or may simply be used to improve the reading of a text message. Present TTS implementations provide voice-enabled e-mail and voice-reply prompts. TTS is widely used on voice recognition systems. Like other devices, the method has its own importance to be interfaced with, where Raspberry Pi seeks its own image processing schemes based operations. Therefore, once the image is translated to text, it can be transformed from text to expression. The cycle of character recognition begins with the translation of text to expression, and can be extended anywhere. Another way to turn the text into expression may be through the English letter ASCII values. Using this form the frequency of the coding can be minimized. There are many Text to Speech converters are there but there performance depends on the fact that the output voice is how much close to the human natural voice. Find a name pretty, for starters, it can be a person's name, as well as stunning. Thus it depends on how you say the wordsMost speech engine text doesn't give the correct pronunciation for such words so adding certain voice recordings will provide more accurate results. The TTS device translates an English text into a speech signal with prosodic attributes which enhance its naturalness. There are many systems that include prosodic processing and synthesized control parameters generation. The proposed system offers synthesized expression of good quality. The

text processing component provides reliable grammatical classification and phonetic transcription.

YOLO Algorithm

You Only Look Once is an algorithm for the identification of objects in real time, which prevents wasting too much time creating geographic ideas. Rather than accurately identifying objects, it prioritizes speed and awareness. YOLO uses a completely different approach. YOLO is a smart, neural convolution network (CNN) for real-time identification of artifacts. The algorithm adds the full image to a single neural network, then splits the image into regions and calculates bounding boxes and probabilities for each region. Those bounding boxes are weighted by the probabilities predicted. YOLO is famous because it achieves high precision, while being able to run in real time as well. The algorithm ”only looks at the picture once” in the sense that predictions need only one forward propagation trip through the neural network. After non-max suppression (which means each object is only identified once by the object detection algorithm), it then outputs known objects together with the bounding boxes. For YOLO, several bounding boxes and class probabilities for those boxes are calculated concurrently by one unified CNN. YOLO trains on full images and optimizes the identification output directly. This approach has a number of advantages over other models of object detection:

- YOLO is extremely fast
- YOLO sees the whole picture through training and testing time so it encodes contextual information about classes as well as their presence indirectly.
- YOLO teaches generalizable representations of objects so that the algorithm outperforms other top detection methods when focused on real images and evaluated on works of art.

Image to speech

Text to speech software consists of two primary components, the module for image processing and the module for voice processing. Image processing module captures image by camera and transforms the image to text. The speech synthesis module converts the text into sound and combines it with specific physical features in order to be able to interpret the tone OCR is a key element of this package. OCR or Optical Character Recognition is a device that instantly identifies the character by means of an optical

system, this technology imitates the ability of the human senses of sight, where the sensor becomes a replacement for the eye and the processing of images takes place in the digital engine as a substitute for the human brain. Tesseract OCR is a type of matrix matching OCR engine3. Tesseract's engine range is due to its simplicity and system extensibility, and the fact that many groups are active researchers to build this OCR engine and also because Tesseract OCR can support 149 languages. We are defining English alphabets within this project. It is translated to a binary image before feeding the image into the OCR to improve the precision of the identification. Binary image conversion is achieved using Imagemagick software, which is another open source image manipulation tool .The OCR output is the text that's stored in a file (speech.txt). Machines still have defects such as edge distortion and dim light effect, so high precision text4 is still difficult for most OCR engines to get. It needs some support and condition to get the minimal OCR implementation of the Tesseract defect.

Hand Gesture recognition

Recognition of hand gestures is a subject in computer science and language technology with the objective of understanding human gestures through mathematical algorithms. Gestures may arise from any gesture or condition of the body but typically come from the face or hand. Current field focuses include identification of feelings through the identification of face and hand movements. Users may use simple gestures to control or communicate with apps, without touching them physically. Several attempts were made to translate the sign language using cameras and computer vision algorithms.Gesture recognition can be seen as a way for computers to begin to understand human body language, thereby creating a richer bridge between machines and humans than simplistic text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to the keyboard and mouse and communicate naturally without any mechanical tools. Using the gesture recognition principle, a finger can be pointed at this point where it will move accordingly. This could make conventional input such and even redundant on devices.

3.4 Modeling, Analysis & Design

System design is the process of defining the architecture, components, modules, interfaces and data for a system to satisfy specified requirements. One could see it as the application of systems theory to product development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering. If the broader topic of product development "blends the perspective of marketing, design, and manufacturing into a single approach to product development," then design is the act of taking the marketing information and creating the design of the product to be manufactured. Systems design is therefore the process of defining and developing systems to satisfy specified requirements of the user.

System Architecture

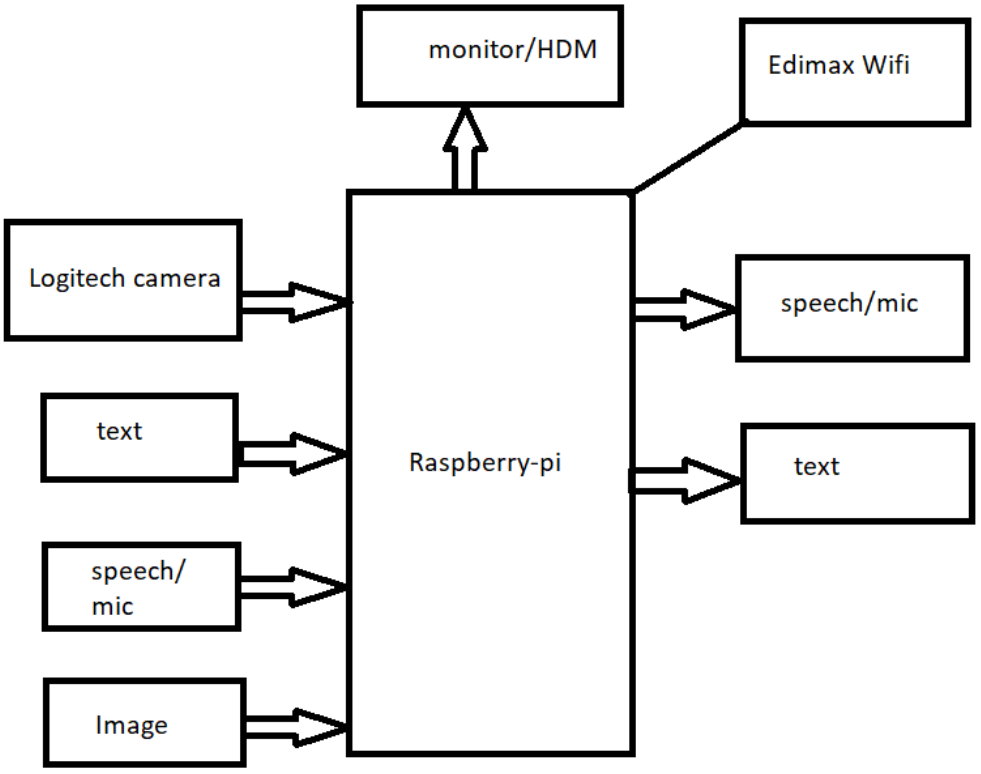


FIGURE 3.1: System Architecture

Figure 3.1 shows the system architecture of the single compact device for people with vocal, visual and hearing impairment using raspberry pi.

The following modules are as follows:

- **Raspberry-pi**

  The Raspberry Pi is a low-priced, credit card-sized device that can conveniently be plugged into a computer monitor or television. We use a black-eye and a regular keyboard. It is a minute device that allows people of all ages to study programming, and know how to program in languages such as Scratch and Python.

- **Logitech Camera**

  Logitech camera is a simple and easy to use plug and play setup. With simple plug-in and play arrangement, we can make video calls in sky-scraping definition in no time on most IMS and Logitech video. With this VGA sensor camera the recorded footage will appear in natural colour. It has a high output 5MegaPixel sensor.

- **Mic**

  A microphone is a device recording audio by transforming waves of sound into an electrical signal. This signal can be reproduced as an analog signal or transformed to a digital signal, which a computer or other digital audio system can process.

- **Text/image**

  Text and image inputs to be converted into speech.

- **Edimax Wifi**

  Edimax Wi-Fi is a tiny sized USB wireless adaptor which would support enormous speed, range and velocity.

- **Monitor/HDMI**

  It is a form of cable connector used to connect audio/video devices like TVs, Blu-ray players, computers, and consoles for videogames.

Use Case Diagram

A use case diagram at its simplest is a graphical representation of a user's interaction with the system and depicting the specifications of a use case. A use case diagram can portray the different types of users of a system and the various ways that they interact with the system.

Use case 1

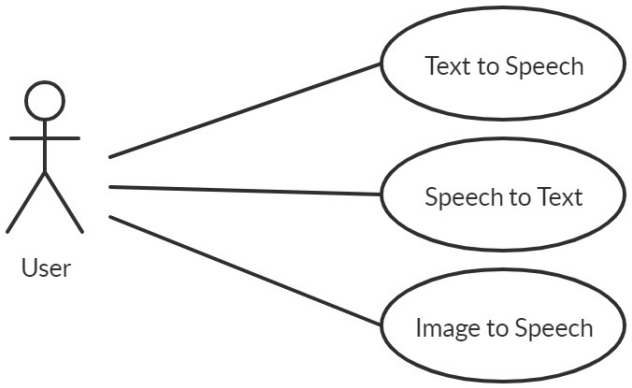


FIGURE 3.2: Use Case Diagram 1

In the figure 3.2, the use case diagram shows that for Blind people they must use the image to speech option , for the deaf people ,they must use the speech to text option and for the dumb people , they must use the text to speech option.

Use case 2

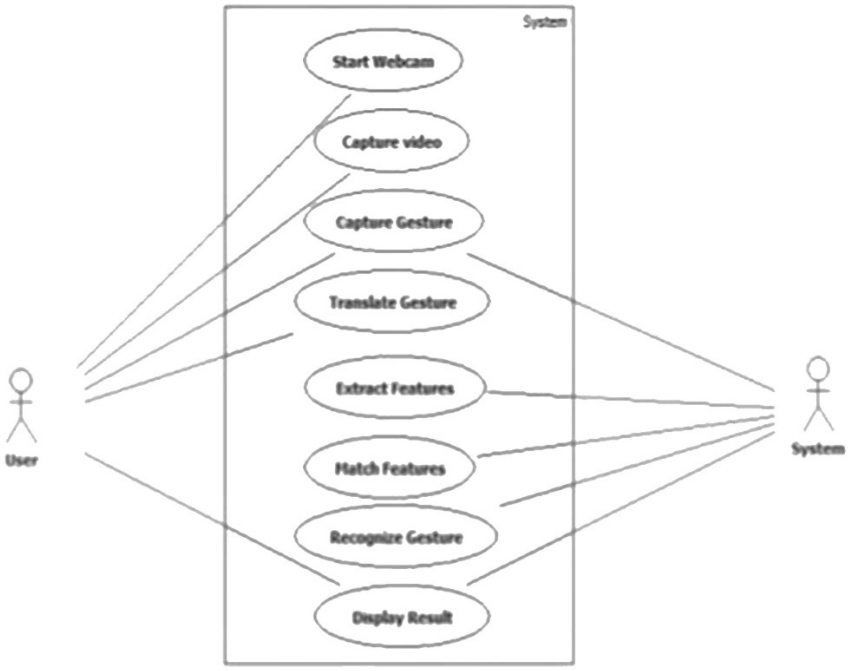


FIGURE 3.3: Use Case Diagram 2

Figure 3.3 shows the use case diagram for hand gestures where the user starts the webcam and shows the hand gestures which gets captured. The system captures and translates the gestures , extracts it , matches the features , recognizes it and finally displays the result

Data Flow Diagram

A data flow diagram is a graphical representation of the "flow" of data through an information system, modeling its process aspects. Often they are a preliminary step used to create an overview of the system which can later be elaborated. DFDs can also be used for the visualization of data processing (structured design).The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of the input data to the system, various processing carried out on these data, and the output data is generated by the system.

DFD 0

Figure 3.4 shows the data flow diagram for the blind people where Image is converted to speech through a software called as the tesseract OCR which identifies or recognizes the characters or texts on images.

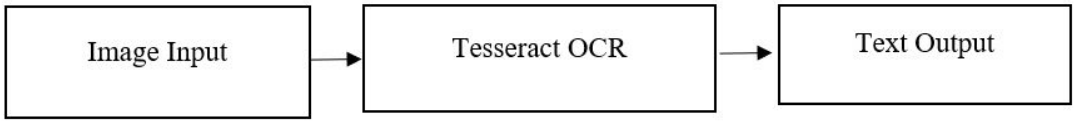


FIGURE 3.4: Data Flow Diagram 0

DFD 1

Figure 3.5 shows the data flow diagram for the dumb people where text is converted to speech using the TTS system.

FIGURE 3.5: Data Flow Diagram 1

DFD 2

Figure 3.6 shows the data flow diagram for the deaf people where the speech which is given as input is recognized and the output is converted to text.

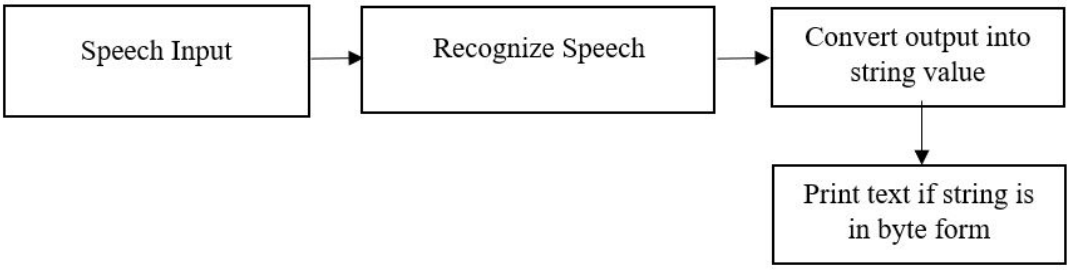


FIGURE 3.6: Data Flow Diagram 2

DFD 3

Figure 3.7 shows the data flow diagram for the deaf and dumb people where hand gestures are converted to text. The various processes are also given in the figure below:

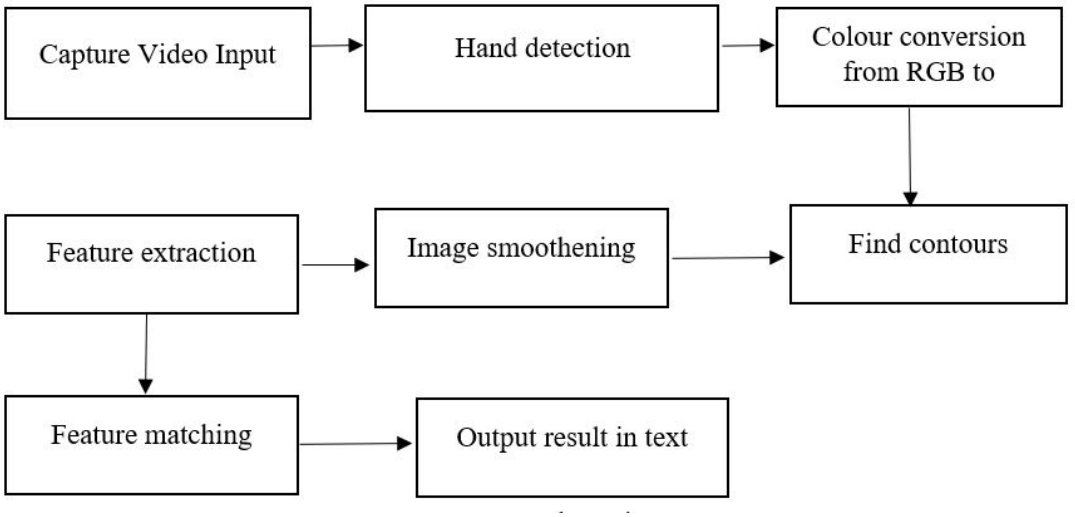


FIGURE 3.7: Data Flow Diagram 3

Sequence Diagram

A sequence diagram shows object interactions arranged in time sequence. It depicts the objects and classes involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario.

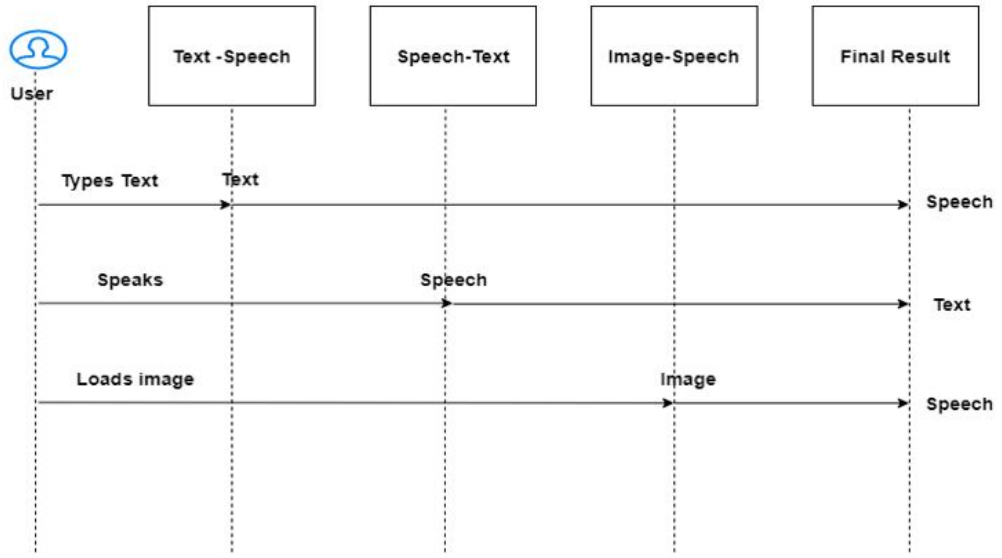


FIGURE 3.8: Sequence Diagram 1

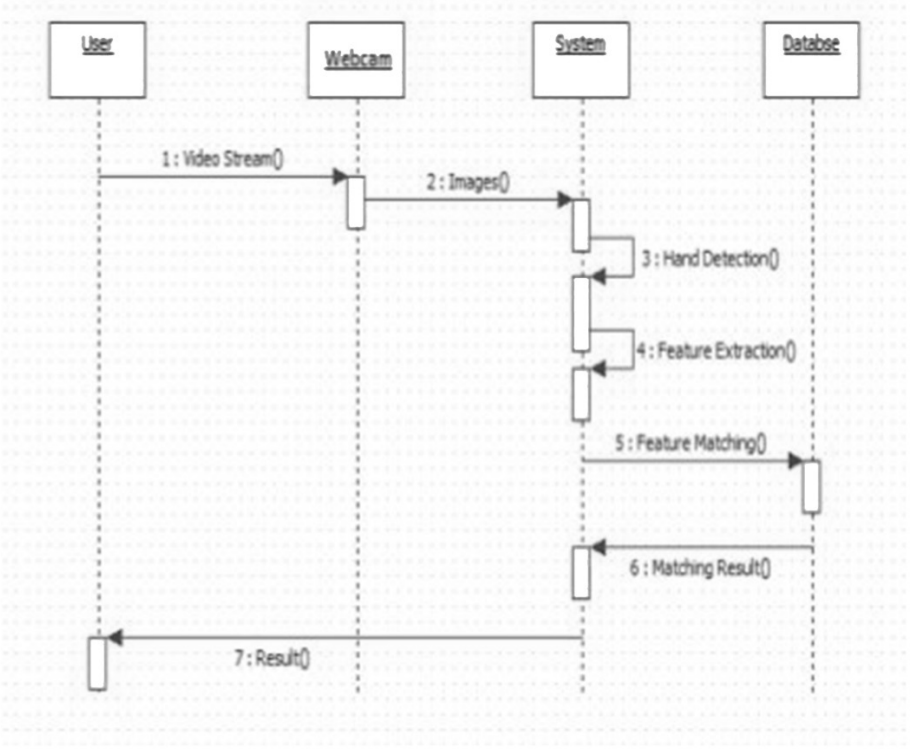


FIGURE 3.9: Sequence Diagram 2

Figures 3.8 and 3.9 show the sequence diagrams for Blind people where they must use the image to speech option , For the deaf people where they must use the speech to text option and for the dumb people where they must use the text to speech option. Finally for both deaf and dumb people hand gestures are used for communication.

Flow Chart

A flow chart is a graphical or symbolic representation of a process. Each step in the process is represented by a different symbol and contains a short description of the process step. The flow chart symbols are linked together with arrows showing the process flow direction.

Figure 3.10 shows the flowchart of the project :

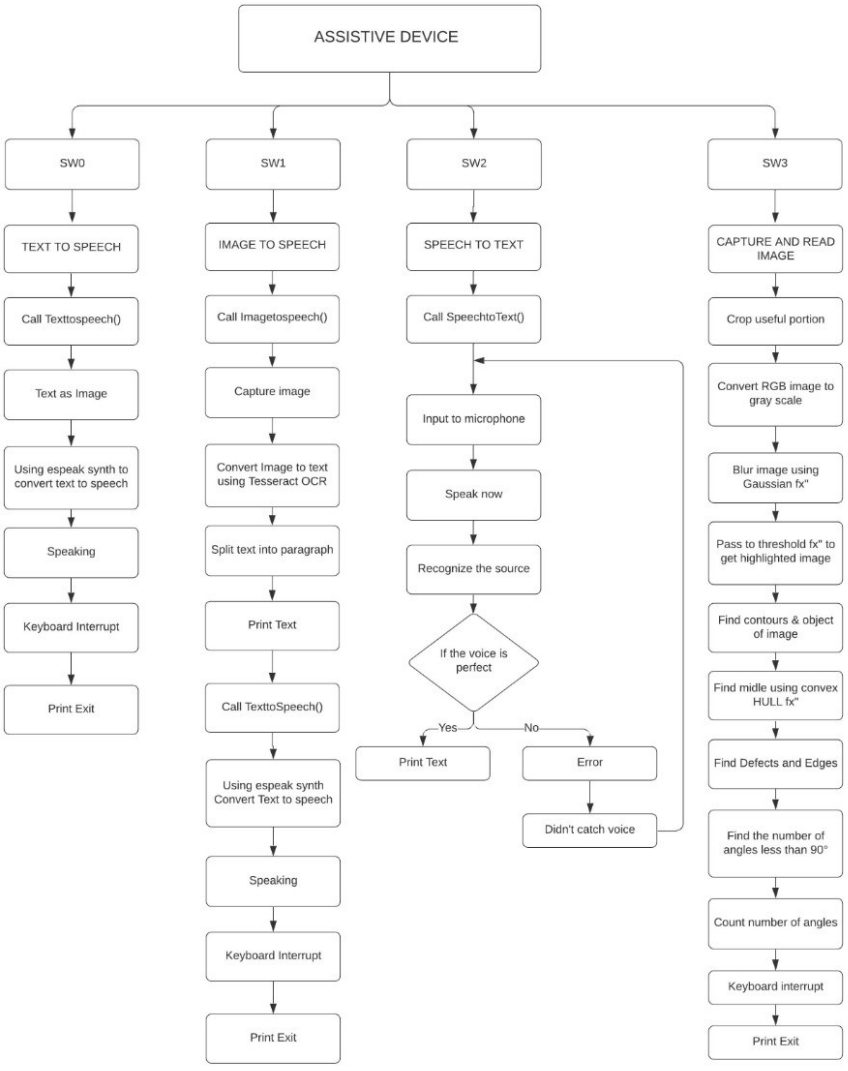


FIGURE 3.10: Flow Chart

3.5 Implementation of Project

The section is divided into two subsections:

- Algorithms
- Pseudocode

3.5.1 Algorithms

For the visually impaired people : Image to Speech

The image to speech conversation consists of the following steps:

Step 1: Image acquisition: The inbuilt camera captures the text images in this stage. The accuracy of the captured image is determined by the camera used.
Step 2: Image Pre-processing: This stage consists of translating color to gray scale, detecting edges, eliminating noise, warping and cropping, and thresholding. The image is transformed to gray scale, since certain functions in OpenCV require the input parameter as a gray image. Removal of noise is achieved with bilateral filter. For better detection of contours, Canny edge detection is done on the gray scale picture. The image is bent and cropped according to the contours. This helps one to identify and isolate only the area that includes text and excludes the unwanted context. Basically Thresholding is achieved in such a manner that the file appears like a scanned text. It is done to allow the OCR to translate the image to a text efficiently.
Step 3: Image to text conversion: Tesseract OCR transforms the pre-processed image into a.txt format, which is in the form of.png.
Step 4: Text to speech conversion: The second section is the framework for voice synthesis. The.txt file is translated to an audio recording. There, using a speech synthesizer named the TTS, the text is translated to voice. The Raspberry Pi has an on-board audio input, and the on-board audio is created by a PWM output.

For the vocally impaired people : Text to Speech

The TTS system (Text To Speech) works as follows:

Step 1: Text to words : It may sound very easy to do, but know, a computer is incredibly dumb and does just what we are asking it to. Written vocabulary is very vague.

They have different sounding words even though they have the same letters, for example reading and speaking.
Step 2: Words to phonemes: Phonemes-any of the perceptually distinct sound units in a given language that separates one word from another, e.g. p, b, d, and t in the English pad, pat, poor, and bat words. Compare it of allophone. The English alphabet comprises only 26 letters but over 40 phonemes. That allows all the various sounds which are used in actual speech.
Step 3: Phonemes to Sound: Three strategies are distinct. Another is to use human recordings saying the phonemes, another is for the machine to produce the phonemes itself by the creation of simple sound frequencies (a little like a music synthesizer), and a third method is to imitate the human speech process.
Step 4: Bringing it all together: Now you have to create all this and place it in a repository to be able to use when it is needed later on.

For the people with hearing impairment : Speech to text

The speech to text conversation consists of the following steps:

Step 1: Some of the python libraries required for this conversion are SpeechRecognition and PyAudio which can be installed through pip.
Step 2: Speech is given as input through a Microphone.
Step 3: Speech is recognized through a recognizer which is converted to a string value
Step 4: If the string value is in bytes then the output gets printed as text. Else an error message is given as output, if the system could not recognize the words .

Hand gestures for the deaf and dumb people

Hand gesture recognition using python and open cv consists of the following steps:

Step 1: The camera captures the video and the color of the image is converted from RGB(Red , Green , Blue) to Gray scale
Step 2: Smoothening of image : Using gaussian blur the image is smoothened. For graphics applications, it is a commonly used method usually to reduce image noise and to minimize detail.
Step 3: Background Subtraction: This is a way of extracting the backdrop from image. We remove shifting foreground from the static backdrop to do this. And it will provide a threshold image which is a black and white image.
Step 4: Motion Detection : The motion detector can note the difference between consecutive frames; when the difference is small, we will conclude the motion has been

detected.
Step 5: Contour Detection: The contours are defined as the line that joins all the points along an image's boundary that have the same strength. Contours come useful in the study of shape, determining the body size of interest, and identifying objects. OpenCV has findContour which helps to extract contours from the image.
Step 6: Finding Convexity defects and convex hull : Convex Hull of a shape or a group of points is a tight fitting convex boundary around the points or the shape. This boundary is made so that it is easy to calculate the area of the shape.
Step 7: Gesture Recognition : After all the above steps are followed if the captured hand gesture matches , the output of it is given in a text form. (example: one , two , three , four , five , Hi).

Single Compact Device(SCD) Algorithm :

The SCD Algorithm implements functions for people with visual , hearing and vocal disabilities through the following procedures:

Step 1: Image to speech conversion for the visually impaired people where the image is given as input and speech is generated as output.
Step 2 : Text to speech conversion for the vocally impaired people where the text is given as input and speech is generated as output.
Step 3 : Speech to text conversion for the people with a hearing impairment where the speech is given as input and text is generated as output.
Step 4: Hand Gesture Recognition for the deaf and dumb masses where the hand gesture is given as input and the output is in the form of text.

3.5.2 Pseudocode:

Algorithm 1 Single Compact Device Algorithm

Result: The functions for the blind , dumb and deaf are implemented respectively

Input: i_p , i_m , t_i , s_i , h_g

[i_p:Input , i_m: Image , t_i:Text Input , s_i: Speech Input , h_g: Hand Gesture]

Output: s_o, t_o

[s_o: Speech Output, t_o: Text Output]

begin

procedure SCD (i_p , i_m , t_i , s_i , h_g)

//Image to speech conversion

if i_p==i_m **then**

  $i_m \leftarrow t$ //t is a temporary text value

  $t \leftarrow s_o$

  Output is s_o

// Text to speech conversion

else if $i_p == t_i$ **then**

  for *each word* **do**

    if *word in* t_i **then**

      output is s_o

  end

  for *each letter* **do**

    if *letter in* t_i **then**

      output is s_o

  end

//Speech to text conversion

else if $i_p == s_i$ **then**

  $s_i \leftarrow str$ //str is the received string value

  if *str is bytes* **then**

    Output is t_o

// Hand Gesture Recognition

else if $i_p == h_g$ **then**

  for *each* h_g **do**

    if h_g *in database* **then**

      generate output is t_o

  end

else

  Input i_p is invalid

end

3.6 Prototype & testing

Testing is a critical element which assures quality and effectiveness of the proposed system in (satisfying) meeting its objectives. Testing is done at various stages in the System designing and implementation process with an objective of developing a transparent, flexible and secured system. Testing is an integral part of software development. Testing process, in a way certifies, whether the product, that is developed, complies with the standards, that it was designed to. Testing process involves building of test cases, against which, the product has to be tested.

Test Objectives

- Testing is a process of executing a program with the intent of finding an error.
- A good case is one that has a high probability of finding an undiscovered error.
- A successful test is one that uncovers a yet undiscovered error. If testing is conducted successfully (according to the objectives) it will uncover errors in the software. Testing can't show the absences of defects are present. It can only show that software defects are present.

Testing Principles

Before applying methods to design effective test cases, a software engineer must under stand the basic principle that guides software testing. All the tests should be traceable to customer requirements.

Testing Design

Any engineering product can be tested in one of two ways:

- **White box Testing**

  This testing is also called as glass box testing. In this testing, by knowing the specified function that a product has been designed to perform test can be conducted that demonstrates each function is fully operational at the same time searches for errors in each function. It is a test case design method that uses the control structure of the procedural design to derive test cases.

- **Black box Testing**

  In this testing by knowing the internal operation of a product, tests can be conducted to ensure that ”all gears mesh”, that is the internal operation that performs according to specification and all internal components have been adequately exercised. It fundamentally focuses on the functional requirements of the software. The steps involved in black box test case design are:

  - Graph based testing methods
  - Equivalence partitioning
  - Boundary value analysis
  - Comparison testing

Testing Strategies

A software testing strategy provides a road map for the software developer. Testing is a set of activities that can be planned in advanced and conducted systematically. For this reason a template for software testing, is a set of steps into which we can place specific test case design methods that should be defined for software engineering process. Any software testing strategy should have the following characteristics:

- Testing begins at the module level and works outward toward the integration of the entire computer based system.
- Different testing techniques are appropriate at different points in time.
- The developer of the software and an independent test group conducts testing.
- Testing and debugging are different activities but debugging must be accommodated in any testing strategy.

Levels of Testing

Testing can be done in different levels of SDLC. They are:

- **Unit Testing**

  The first level of testing is called unit testing. Unit testing verifies on the smallest unit of software designs-the module. The unit test is always white box oriented. In this different modules are tested against the specifications produced during design for the modules. Unit testing is essentially for verification of the code produced during the coding phase, and hence the goal is to test the internal logic of the modules. It is typically done by the programmer of the module. Due to its close association with coding, the coding phase is frequently called "coding and unit testing." The unit test can be conducted in parallel for multiple modules. The Test cases in unit testing are as follows:

TABLE 3.1: Unit Test Case 1

Test Case ID	Unit Test Case 1
Description	User opens the code
Input	User runs the code
Expected output	Code opened
Actual Result/Remarks	GUI window opened
Passed(?)	Yes

TABLE 3.2: Unit Test Case 2

Test Case ID	Unit Test Case 2
Description	User enters the text using GUI
Input	Text
Expected output	Speech
Actual Result/Remarks	Expected output generated
Passed(?)	Yes

TABLE 3.3: Unit Test Case 3

Test Case ID	Unit Test Case 3
Description	User enters speech using GUI
Input	Speech
Expected output	Text
Actual Result/Remarks	Expected output generated
Passed(?)	Yes

TABLE 3.4: Unit Test Case 4

Test Case ID	Unit Test Case 4
Description	Image is loaded using GUI
Input	Image
Expected output	Speech
Actual Result/Remarks	Expected output generated
Passed(?)	Yes

TABLE 3.5: Unit Test Case 5

Test Case ID	Unit Test Case 5
Description	Hand Gestures are Captured by a camera
Input	Hand Gesture
Expected output	Text
Actual Result/Remarks	Expected output generated
Passed(?)	Yes

- **Integration Testing**

  The second level of testing is called integration testing. Integration testing is a systematic technique for constructing the program structure while conducting tests to uncover errors associated with interfacing. In this, many tested modules are combined into subsystems, which are then tested. The goal here is to see if all the modules can be integrated properly. There are three types of integration testing:

  - Top-Down Integration: Top down integration is an incremental approach to construction of program structures. Modules are integrated by moving downwards through the control hierarchy beginning with the main control module.
  - Bottom-Up Integration: Bottom up integration as its name implies, begins construction and testing with automatic modules.
  - Regression Testing: In this contest of an integration test strategy, regression testing is the re-execution of some subset of test that have already been conducted to ensure that changes have not propagated unintended side effects.

TABLE 3.6: Integration Test Case

Test Case ID	Integration Test Case 1
Description	Raspberry-pi is running successfully with wifi
Input	Data
Expected output	Data should be converted as per choice of the person with disability
Actual Result/Remarks	Working as required
Passed(?)	Yes

- **Functional Testing**

  Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals. Functional testing is centered on the following items:

TABLE 3.7: Functional Testing Items

Valid Input	Identified classes of valid input must be accepted
Invalid Input	Identified classes of invalid input must be rejected
Functions	Identified functions must be exercised
Output	Identified classes of application outputs must be exercised

Sytems/Procedures: Interfacing systems or procedures must be invoked Organization and preparation of functional tests is focused on requirements, key functions, or special test cases. In addition, systematic coverage pertaining to identify Business process flows; data fields, predefined processes, and successive processes must be considered for testing. Before functional testing is complete, additional tests are identified and the effective value of current tests is determined.

Chapter 4

RESULTS AND DISCUSSIONS

In this section we discuss the various results and analysis that are derived from the project execution,and compares the results with the stated to objectives.

4.1 Results & Analysis

The project highlighted major communication concerns of people with disabilities such as the deaf , blind and mute with people without disabilities . The complete project is catered for with Python's source code. The entire project is run by the python source code to assist the blind, deaf, and dumb masses with a single system that is so lightweight and easy to handle for them. By using Raspberry-pi, a simple compact device is built which makes use of four important processes. The first process is for the blind where image is converted to speech by using the Tesseract OCR software. For the dumb masses who can't speak, the second process gets on and then they turn their thoughts by text that could be transformed into a voice signal. The voice message being converted is sent over the espeak. The third process we supply people who can't understand other people's words for the hard of hearing. It is carried out by accessing the speech signal through the microphone and then receiving the signal it translates into text to other people which is displayed on the LCD Display . The final and fourth process is for both the deaf and dumb masses where their hand gestures or sign languages are captured through a camera and is later converted to text.

4.2 Screenshots & Code Snippets

Figure 4.1 shows the Tkinter Window which is the standard Graphical User Interface for Python .This window opens as soon as the python code is executed.

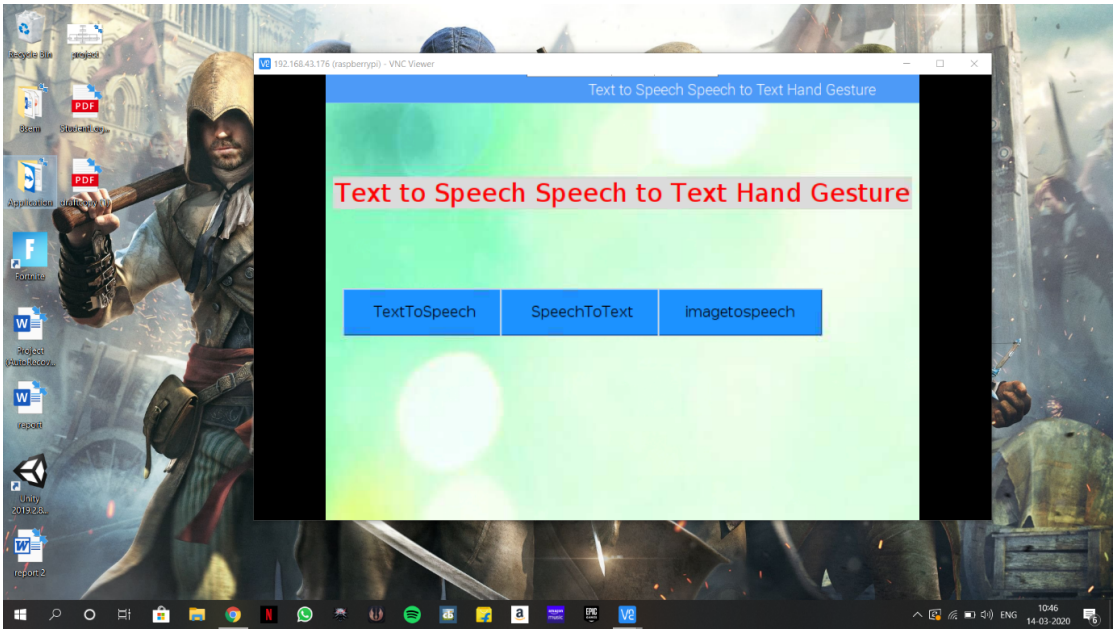


FIGURE 4.1: Tkinter Window

Figure 4.2 shows the Input screen for the Text to speech Conversion for the people with vocal impairment . The user can type in text in the text bar given and when the ”Input” button is clicked . the text is converted to speech.

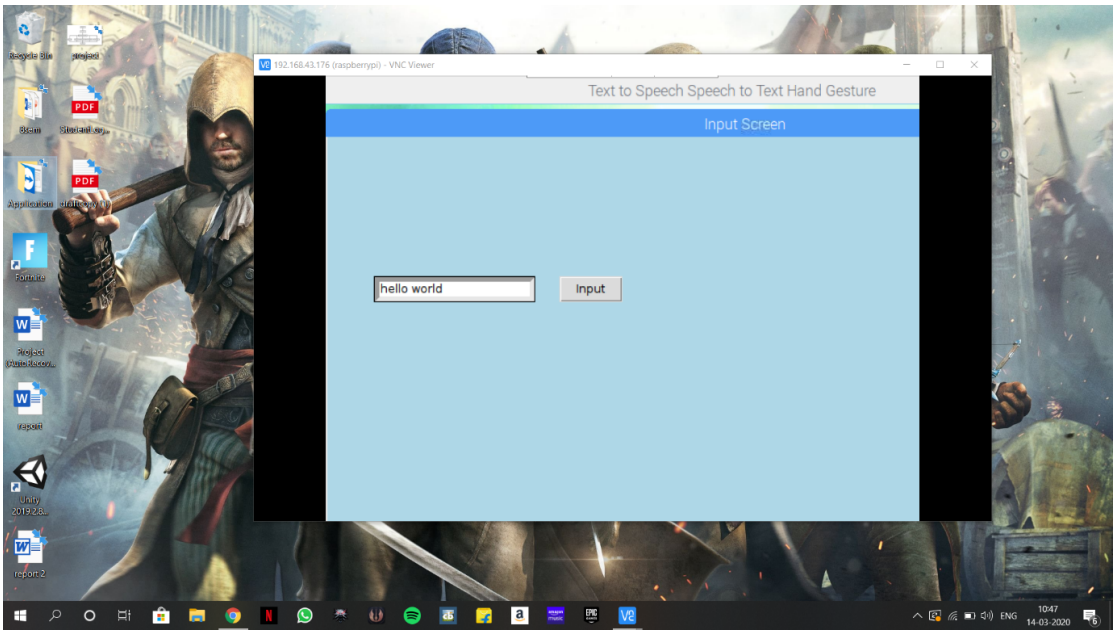


FIGURE 4.2: Input screen for text to speech conversion

Figure 4.3 shows the output screen for the text to speech conversion. The text which was given as input is successfully converted as speech.

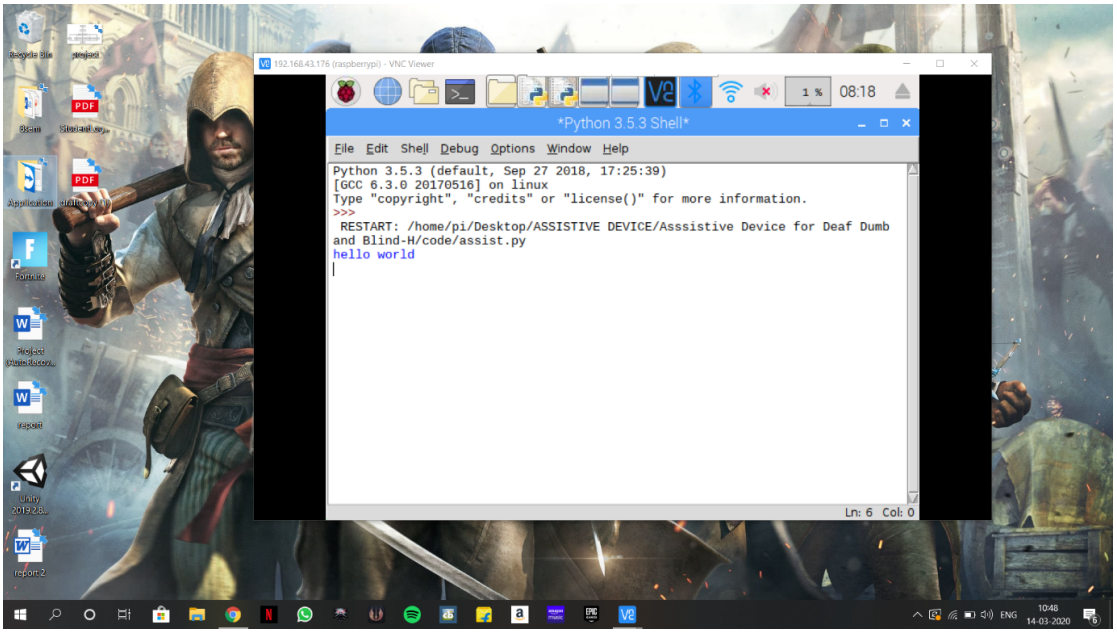


FIGURE 4.3: Output screen for text to speech conversion

Figure 4.4 shows a headphone through which the output which is in the form of speech is generated. The input which was given as text is converted to speech.

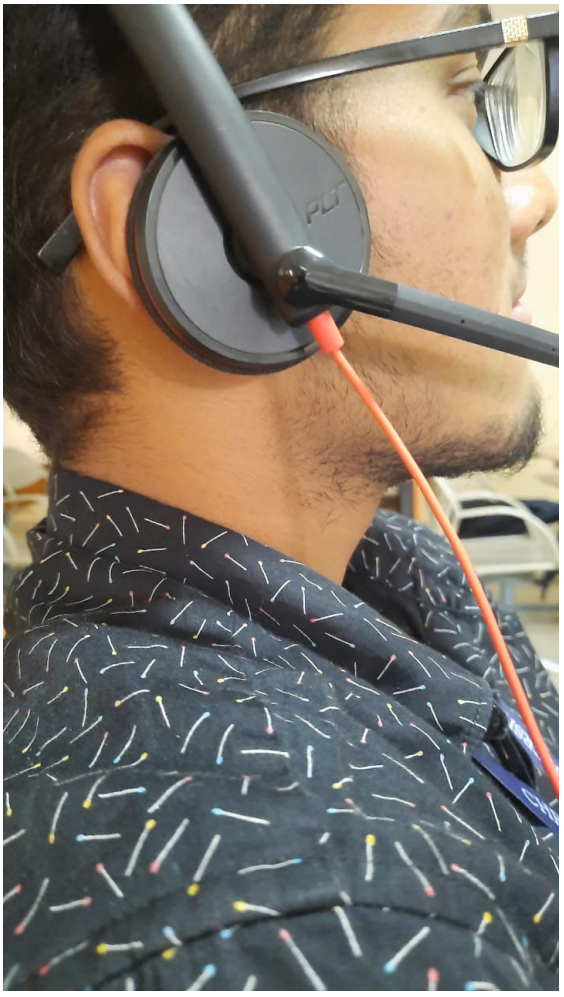


FIGURE 4.4: Output of text to speech conversion through a headphone or speaker

Figure 4.5 shows a Mic through which the input is given for speech to text conversion for the people with hearing impairment. People with no disabilities can easily communicate with the deaf masses by giving input through a mic which will be converted to text.

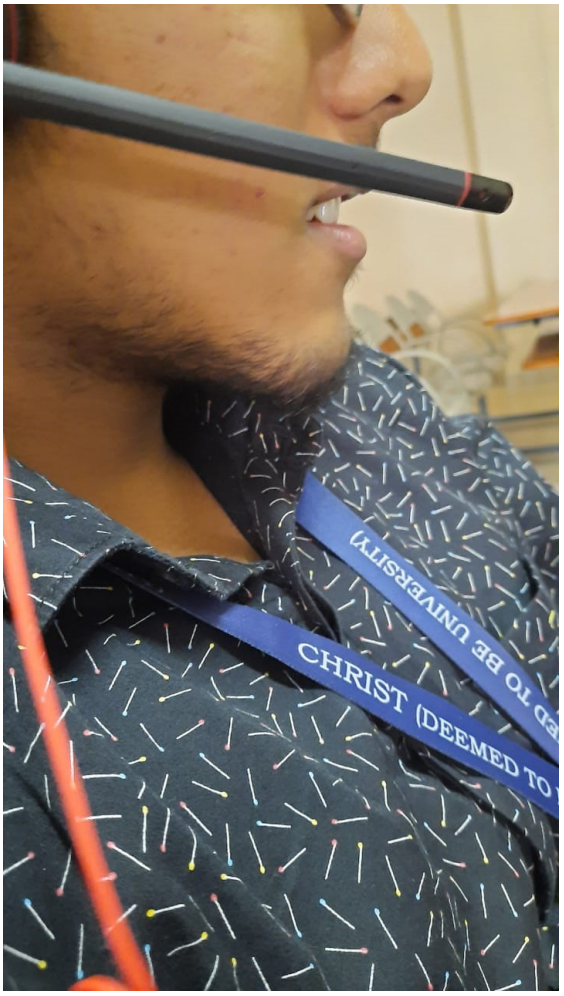


FIGURE 4.5: Mic through which input is given for speech to text conversion

Figure 4.6 shows shows the output screen for the speech to text conversion.It first requests for a moment of silence and later asks the user to say something so that the speech can be recognized

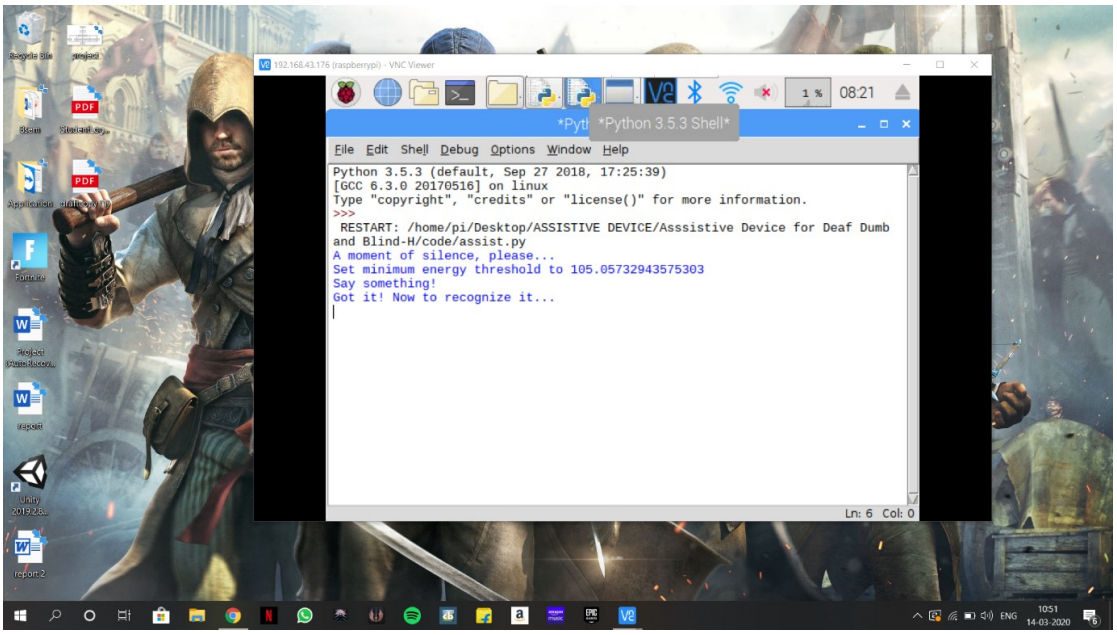


FIGURE 4.6: Output screen for speech to text conversion

Figure 4.7 shows the output as an error message if the user gives a noisy input through the mic or if the speech is not clear enough.

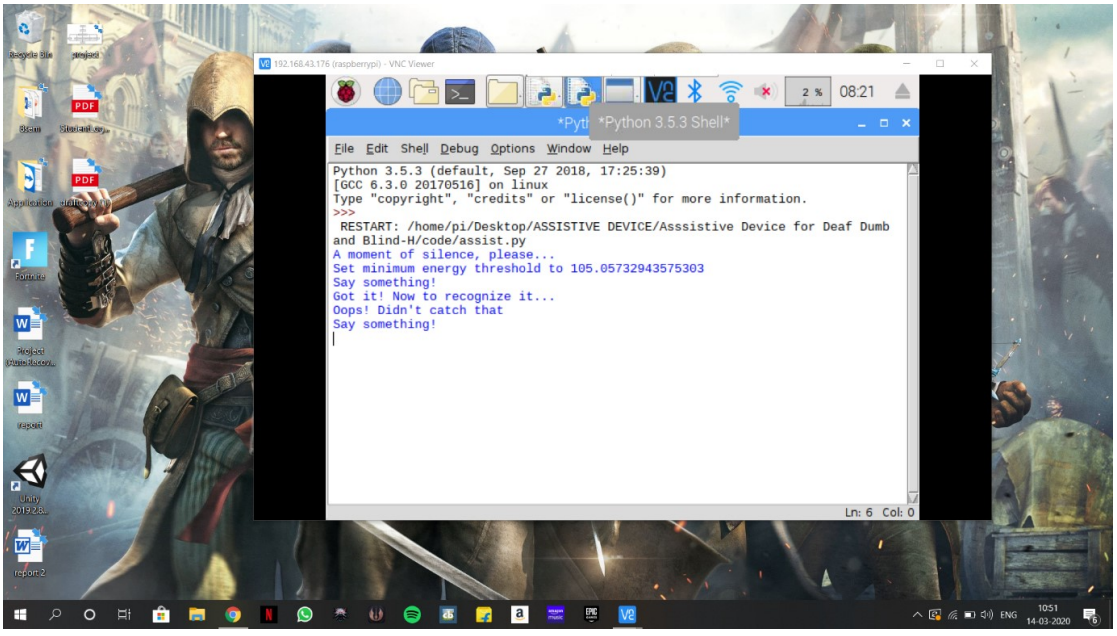


FIGURE 4.7: Output shows error if a noisy input is given

Figure 4.8 shows the output screen for the speech to text conversion. The speech is successfully converted to text if the it is recognized clearly.

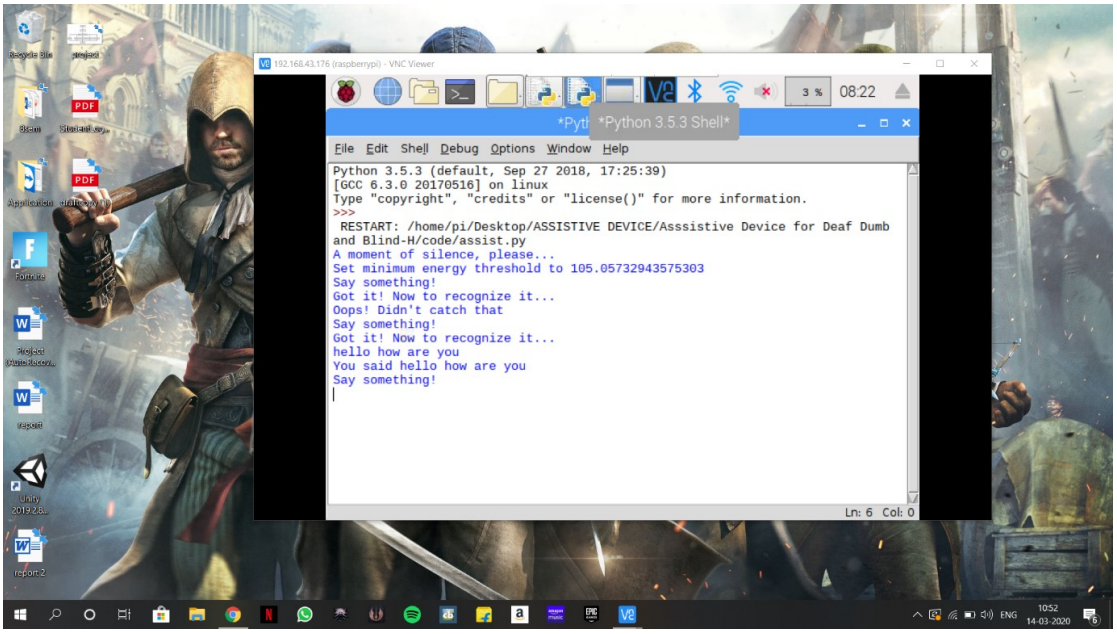


FIGURE 4.8: Successful Output of speech to text conversion

Figure 4.9 shows the output of the speech to text conversion on an LCD Display.A welcome message is displayed on the screen once the LCD is connected to the raspberry pi board.

FIGURE 4.9: LCD Display to show output of speech to text conversion

Figure 4.10 shows the output of the speech to text conversion on an LCD Display. The text which is generated from the speech which was the input is displayed on the LCD Screen.

FIGURE 4.10: Output for speech to text conversion displayed on LCD Screen

Figure 4.11 Shows an Image which is to be given as input for image to speech conversion. This function is for the people with visual impairments. The device with the help of Tesseract Optical Character Recognition captures the characters on images. Finally these characters or texts are converted to speech.

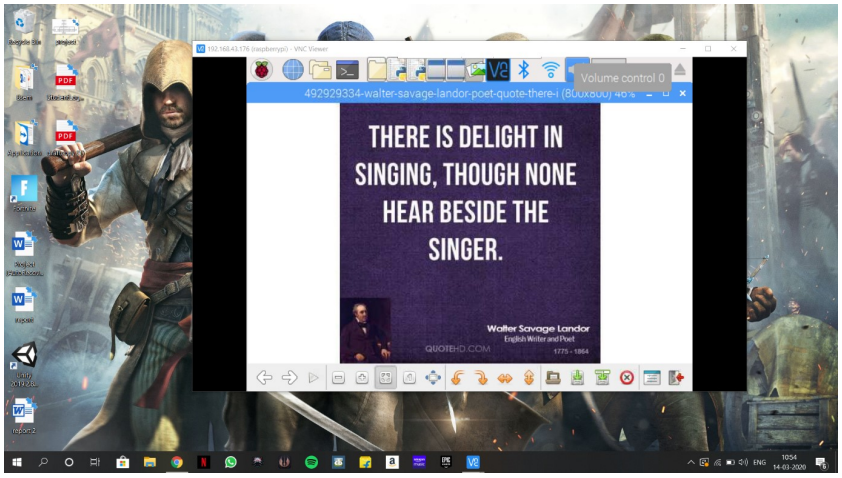


FIGURE 4.11: Image to be given as input for image to speech conversion

Figure 4.12 shows the input screen for image to speech conversion. the user enters the location of the image in the system by pressing the ”browse” button. Finally when the ”ok” button is pressed , speech is generated as output.

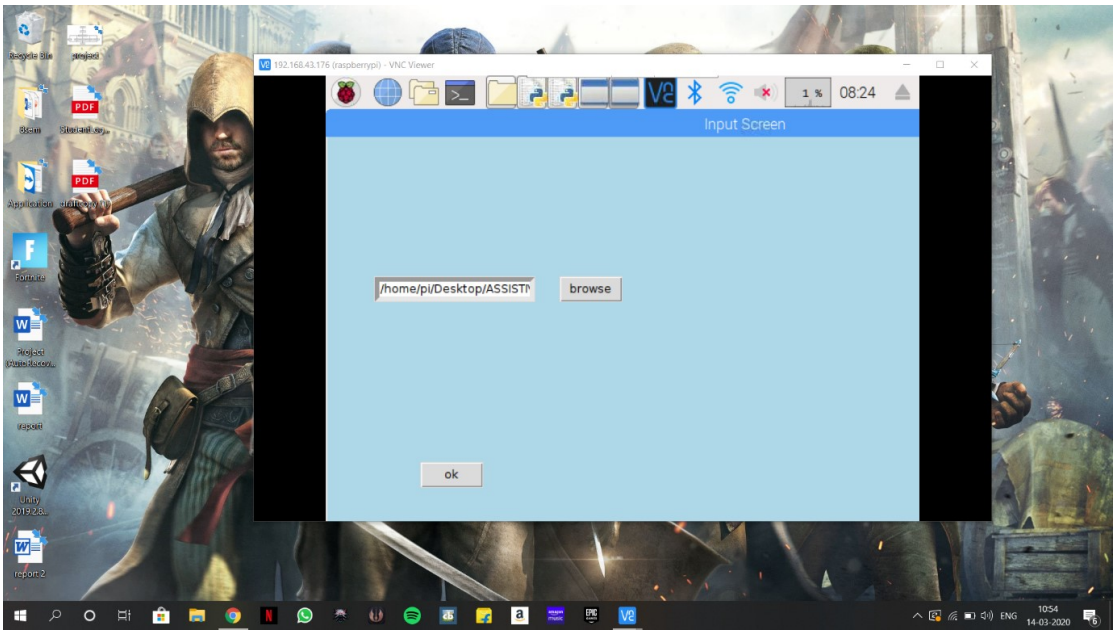


FIGURE 4.12: Input Screen for Image to speech conversion

Figure 4.13 shows the output screen for the Image to speech conversion. The Image which was given as input is successfully converted as speech.

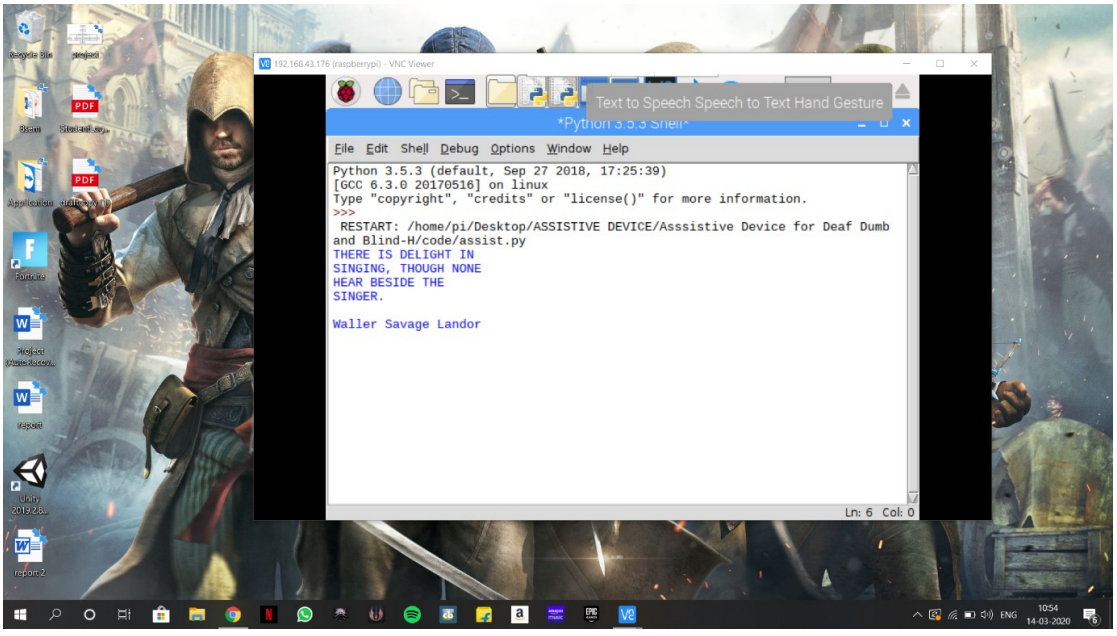


FIGURE 4.13: Output Screen for Image to speech conversion

Figure 4.14 shows a camera which is used to capture hand gestures. These hand gestures will go under a lot of processes and finally be converted to text. The deaf and dumb masses can communicate with the normal masses through this function.

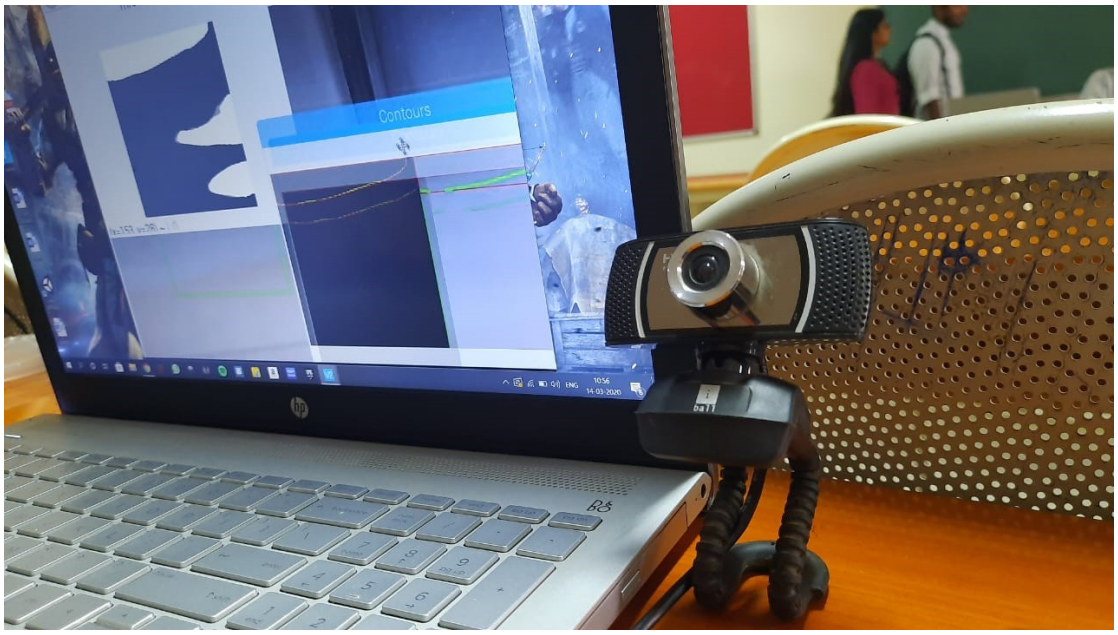


FIGURE 4.14: Camera to capture hand gestures

Figure 4.15 shows the hand gesture ”TWO” with contours.A Contour is an outline representing or bounding the shape or form of something.

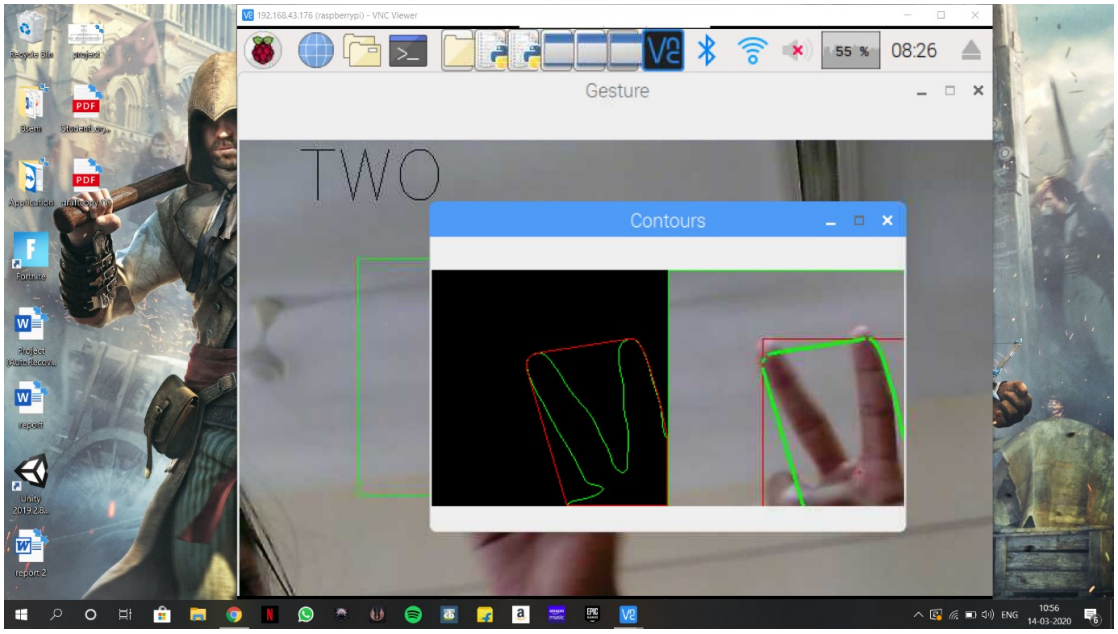


FIGURE 4.15: Hand gesture – “TWO” with contours

Figure 4.16 shows the hand gesture ”THREE” with contours.A Contour is an outline representing or bounding the shape or form of something.

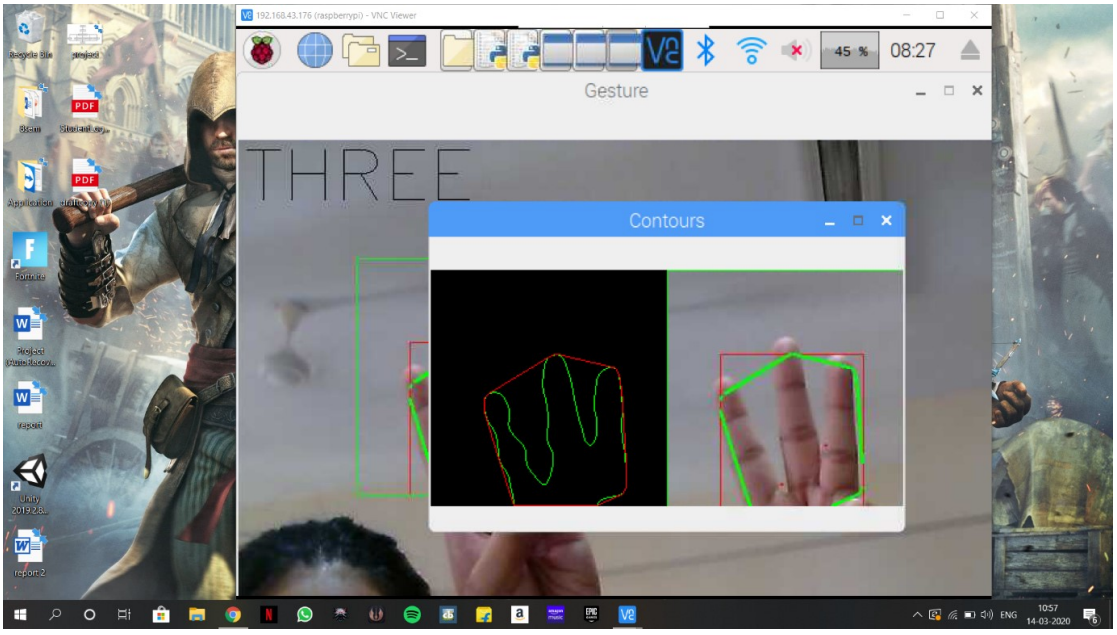


FIGURE 4.16: Hand gesture – “THREE” with contours

Figure 4.17 shows the hand gesture ”FOUR” with contours.A Contour is an outline representing or bounding the shape or form of something.

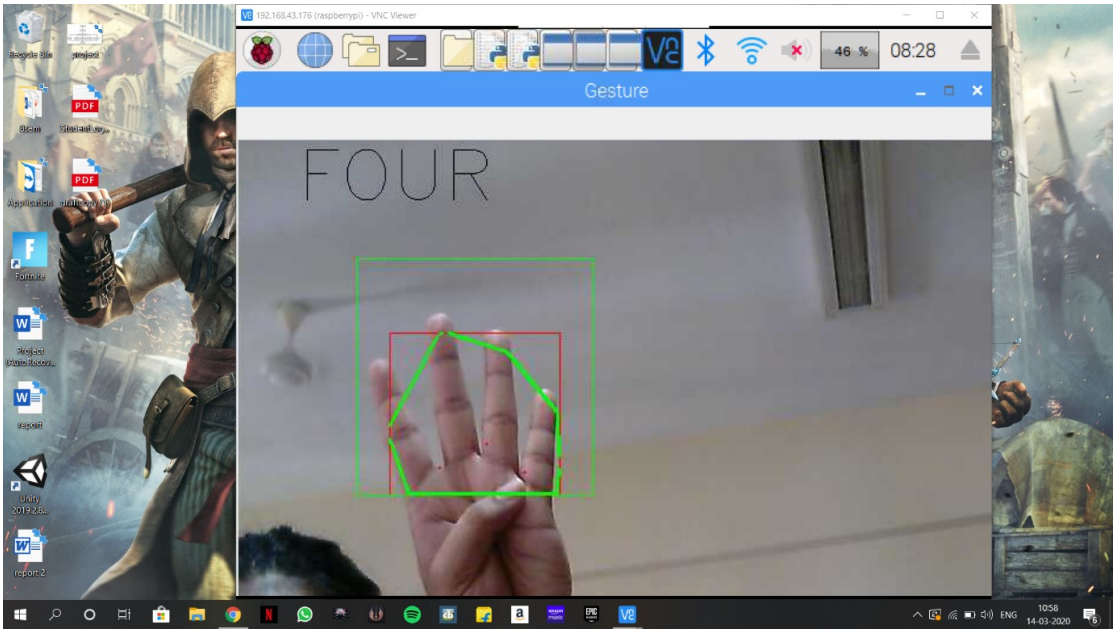


FIGURE 4.17: Hand gesture – “FOUR” with contours

Figure 4.18 shows the hand gesture ”TWO” with it’s respective thresholded image. Image thresholding is a simple type of segmentation of an image. Creating a binary image from a gray or full-color image is a way to do so. Usually this is done to separate ”object” or foreground pixels from background pixels to assist in the processing of images.

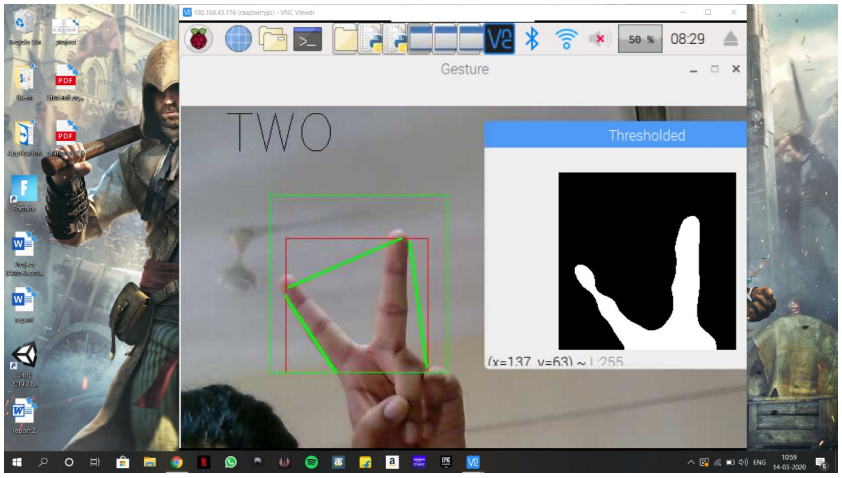


FIGURE 4.18: Hand gesture – “TWO” with thresholded image

Figure 4.19 shows the hand gesture ”HI” with it’s respective thresholded image. Image thresholding is a simple type of segmentation of an image. Creating a binary image from a gray or full-color image is a way to do so. Usually this is done to separate ”object” or foreground pixels from background pixels to assist in the processing of images.

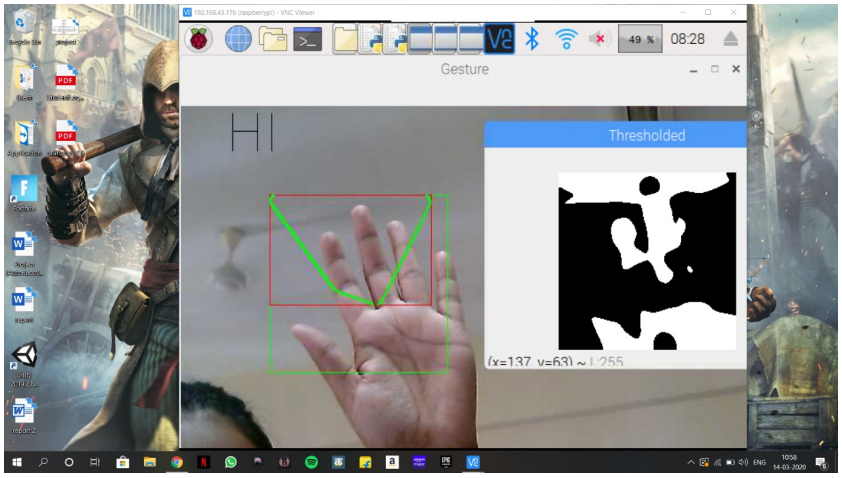


FIGURE 4.19: Hand gesture – “HI” with thresholded image

Figure 4.20 shows the code snippet for text to speech conversion. Packages like tkinter and pysttx3 are used to diplay GUI Window and to convert text to speech respectively.

text to speech thirty percent.py - C:\Users\maniv\OneDrive\Desktop\8sem\Project\Asssistive ...

File Edit Format Run Options Window Help

```
from tkinter import *

#display GUI window
t = Tk()
t.title("Input Screen")
t.geometry('900x700')
t.configure(bg='light blue')
#t.resizable(width = FALSE ,height= FALSE)

e1 = Entry(t,bd=8,text='')   #Entry box
e1.place(x=50 ,y=150)

#Text to Speech
def TTS():
    import pyttsx3  #pyttsx3 converts text to speech

    path = e1.get()    #to import text from the Entry box
    print (path)   #prints the same text in the python shell
    engine = pyttsx3.init()  #object creation
    engine.say(path)    #speech input
    engine.runAndWait() #speech output

#Button
browse = Button(t, text='Input',width=5,height=1,command=TTS)
browse.place(x =250 ,y=150)

t.mainloop()
```

FIGURE 4.20: Text to speech conversion

Figure 4.21 shows the code snippet for speech to text conversion.A Package called speech recognition is used to perform speech recognition.

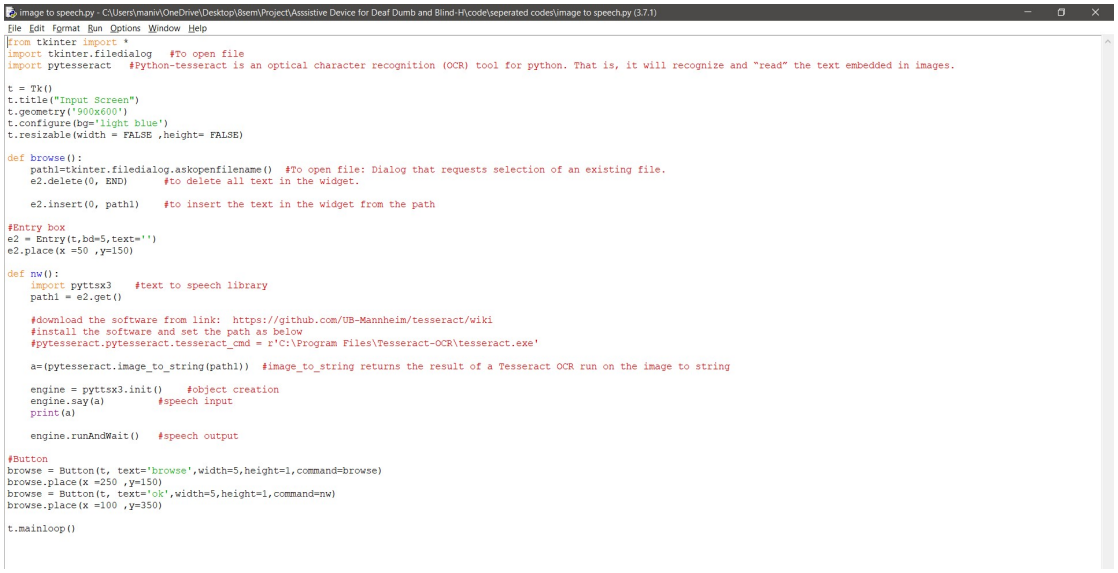
speech to text.py - C:\Users\maniv\OneDrive\Desktop\8sem\Project\Asssistive Device for De...

File Edit Format Run Options Window Help

```
import speech_recognition as sr  #library for performing speech recognition

r = sr.Recognizer()   #recognizing speech from an audio source
m = sr.Microphone()   #taking the input from Microphone

print("A moment of silence, please...")

while True:
    print("Say something!")

    with m as source:
        audio = r.listen(source)    #recognized speech from microphone
    print("Got it! Now to recognize it...")

    try:
        value = r.recognize_google(audio)      #speech received
        print(value)

        if str is bytes:
            print(u"You said {}".format(value).encode("utf-8"))  #printing the s

        else:
            print("You said {}".format(value))

    except sr.UnknownValueError:   #type of value error
        print("Oops! Didn't catch that")
```

FIGURE 4.21: Speech to text conversion

Figure 4.22 shows the code snippet for image to speech conversion. Packages like tkinter and pytesseract are used to diplay GUI Window and to recognize and read the text embedded in images respectively.



```
image to speech.py - C:\Users\manivi\OneDrive\Desktop\8sem\Project\Assistive Device for Deaf Dumb and Blind-H\code\seperated codes\image to speech.py (3.7.1)
File Edit Format Run Options Window Help
from tkinter import *
import tkinter.filedialog   #To open file
import pytesseract   #Python-tesseract is an optical character recognition (OCR) tool for python. That is, it will recognize and "read" the text embedded in images.

t = Tk()
t.title("Input Screen")
t.geometry('900x600')
t.configure(bg='light blue')
t.resizable(width = FALSE ,height= FALSE)

def browse():
    path1=tkinter.filedialog.askopenfilename()  #To open file: Dialog that requests selection of an existing file.
    e2.delete(0, END)      #to delete all text in the widget.

    e2.insert(0, path1)    #to insert the text in the widget from the path

#Entry box
e2 = Entry(t,bd=5,text='')
e2.place(x =50 ,y=150)

def nw():
    import pyttsx3    #text to speech library
    path1 = e2.get()

    #download the software from link:  https://github.com/UB-Mannheim/tesseract/wiki
    #install the software and set the path as below
    #pytesseract.pytesseract.tesseract_cmd = r'C:\Program Files\Tesseract-OCR\tesseract.exe'

    a=(pytesseract.image_to_string(path1))  #image_to_string returns the result of a Tesseract OCR run on the image to string

    engine = pyttsx3.init()    #object creation
    engine.say(a)          #speech input
    print(a)

    engine.runAndWait()   #speech output

#Button
browse = Button(t, text='browse',width=5,height=1,command=browse)
browse.place(x =250 ,y=150)
browse = Button(t, text='ok',width=5,height=1,command=nw)
browse.place(x =100 ,y=350)

t.mainloop()
```

FIGURE 4.22: Image to speech conversion

Figure 4.23 shows the code snippet for the LCD Display connection.

```
assist.py - C:\Users\manivi\OneDrive\Desktop\8sem\Project\Assistive Device for Deaf Dumb and Blind-H\code\assist.py (3.7.1)
File Edit Format Run Options Window Help
        lcd_toggle_enable()

        GPIO.output(LCD_D4, False)
        GPIO.output(LCD_D5, False)
        GPIO.output(LCD_D6, False)
        GPIO.output(LCD_D7, False)
        if bits&0x01==0x01:
            GPIO.output(LCD_D4, True)
        if bits&0x02==0x02:
            GPIO.output(LCD_D5, True)
        if bits&0x04==0x04:
            GPIO.output(LCD_D6, True)
        if bits&0x08==0x08:
            GPIO.output(LCD_D7, True)

        lcd_toggle_enable()

    #*********************************************************************************#

def lcd_toggle_enable():

        time.sleep(E_DELAY)
        GPIO.output(LCD_E, True)
        time.sleep(E_PULSE)
        GPIO.output(LCD_E, False)
        time.sleep(E_DELAY)

    #*********************************************************************************#

def lcd_string(message,line):
      # Send string to display

      message = message.ljust(LCD_WIDTH," ")

      lcd_byte(line, LCD_CMD)

      for i in range(LCD_WIDTH):
        lcd_byte(ord(message[i]),LCD_CHR)

lcd_init()
lcd_string("WEL-COME",LCD_LINE_1)
lcd_string("SPEECH TO TEXT SYTEM",LCD_LINE_2)
time.sleep(3)


#Speech to Text
```

FIGURE 4.23: LCD display connection

Figure 4.24 shows the code snippet for Hand Gesture recognition.

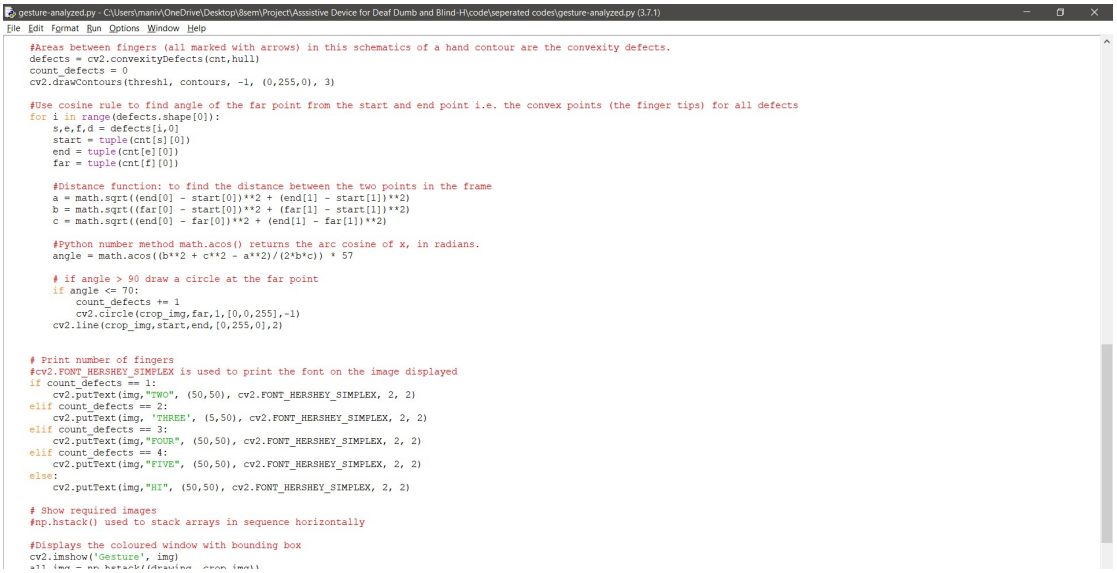


FIGURE 4.24: Hand gesture recognition

Chapter 5

CONCLUSION & FUTURE SCOPE

In this section we have highlighted the main points of the project and hence drawn our conclusions. We also study the future scope of the project in order to improve the efficiency as well as the relevency of the project.

5.1 Conclusions

The project designs the prototype model for blind, deaf and dumb people by employing a single compact device. The important key factor of this project is to facilitate these people and to fix them more confident to manage their sites by themselves. The primary advantage is that the device can be taken away easily and is of about less weight. The project has taken into consideration that can arrive in case of the three types of disabilities (Blind, Deaf and Dumb) and facilitate every disabled person and the normal person to communicate with the disabled ones. The person can communicate and transfer the message as per his ability and desire. For the blind , the image is converted to speech or audio , the dumb can express their thoughts through text which can be converted to an audio message and to communicate with the deaf, audio messages can be converted to text which is displayed as text on an LCD display. Hand Gesture recognition and voice conversion for dumb and deaf person was also successfully executed using image processing. The method takes image as input and gives text and speech as an output. Implementation of this system gives up to 90 percent accuracy and works successfully in most of the test cases. Thus this approach can tackle to any type of difficulty that can come across the process of communication among differently abled people and the normal world.

5.2 Scope for Future Work

By providing a battery backup to the raspberry pi we can achieve the main aim of the proposed project of portability. The advanced concepts required for the communication can be added for the easy recognition. However due to the less resolution of the web-cam, the output obtained is not 100 percent accurate. The accuracy can be improved by making use of a HD camera or mobile camera. To further this project can be followed out with any other advanced devices by using simple coding language to get it less complicated. The complication can be reduced by a tiny gadget which could be more useful those people in this electronic world. Many number of languages can be integrated to this device as English is not the only language spoken among these masses.

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